2D momentum recap

Vector sums

$$\sum P_i = \sum P_f$$

before — after

Collisions or explosions

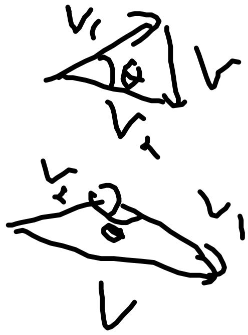
components

$$V = \sqrt{\sum V_x + \sum V_y}$$

or

cosine law

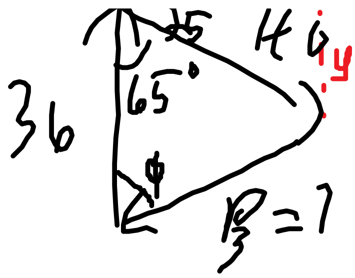
$$V^2 = V_1^2 + V_2^2 - 2V_1V_2\cos\theta$$



eg. 1. A 10.0 kg bomb explodes into 3 pieces.
3.0 kg moves north at 12.0 m/s
5.0 kg moves 25.0º South of East at 8.0 m/s
What is the the velocity (magnitude and direction) of the third piece?

$$\sum P_i = 0 = \sum P_f$$

$$P_3^2 = 36^2 + 40^2 - 2(36)(40)$$



$P_3^2 = 36^2 + 40^2 - 2(36)(40)\cos 65$

Sqrt(36^2+40^2-(2x36x40xCos(65)))=
40.97388688160773 kgm/s

v= p/m = 40.97/2=20.485 m/s

sinϕ/40 = sin65/40.97

Asin(Sin(65)x40/40.97)=62.23308885700992

28ºSouth of West (or 62ºWest of South)

components:

x = 40xcos(25)=36.252311481466

y = 36-(40xSin(25))=19.09526953037202

resultant momentum = Sqrt(36.252311481466^2+ 19.09526953037202^2)=40.97388688160772

same as before! coincidence? I think not!

angle = Atan(19.095/36.252)=27.77710214619047

28º South of West

2. A 500.0 kg car moving north at 12.0 m/s collides with a 750.0 kg car moving East at 10.0 m/s. What is the velocity of the 500 kg car after the collision if

a) they stick together

b) the 750.0 kg car bounces off at 5.0 m/s 50.0º North of East. Was it an elastic collision? Are these realistic numbers?

If you are finished early, work on labbook questions review 1, 3, 7, 9, 11 p26-28